

WHAT IS CLAIMED IS:

1. A bioconjugate of a bioactive agent and an organocobalt complex wherein the bioactive agent is covalently conjugated to the cobalt atom through a non-reactive atom in the bioactive agent molecule, wherein said bioactive agent is selected from the group consisting of a peptide, a peptide analogue, a protein, a protein analogue, a nucleic acid and a nucleic acid analogue.
2. The bioconjugate of claim 1, wherein said non-reactive atom is selected from the group consisting of a carbon atom, a nitrogen atom, an oxygen atom, a sulfur atom, a selenium atom or a silicon atom.
3. The bioconjugate of claim 1, wherein said non-reactive atom is a carbon atom.
4. The bioconjugate of claim 1, wherein the non-reactive carbon atom is a carbon atom from an alkyl, acyl or aryl group that will not lead to rearrangement or destruction of the bioactive agent under conditions of ligand exchange during receptor-mediated endocytosis.
5. The bioconjugate of claim 1, wherein said bioactive agent is covalently bound directly to the cobalt atom of the organocobalt complex.
6. The bioconjugate of claim 1, wherein said bioactive agent is covalently bound indirectly to the cobalt atom of the organocobalt complex via a spacer.
7. The bioconjugate of claim 6, wherein said spacer is a self-destructing linker.
8. The bioconjugate of claim 1, wherein said bioactive agent is a peptide or peptide analogue.

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wherein the substituents may be included or omitted to modulate physical properties of the molecule, e.g., water solubility, stability or  $\lambda_{\max}$  -- the wavelength at which the complex absorbs.

16. The bioconjugate of claim 15, wherein said targeting molecule is selected from the group consisting of glucose, galactose, mannose, mannose 6-phosphate, transferrin, cobalamin, asialoglycoprotein,  $\alpha$ -2-macroglobulins, insulin, a peptide growth factor, folic acid or derivatives, biotin or derivatives, YEE(GalNAcAH)<sub>3</sub> or derivatives, albumin, texaphyrin, metallotexaphyrin, a vitamin, a coenzyme, an antibody, an antibody fragment and a single-chain antibody variable region (scFv).
17. The bioconjugate of claim 1, wherein said organocobalt complex is selected from the group consisting of organo(pyridine)bis(dimethylglyoximate)cobalt, a corrinoid, derivatives thereof and analogues thereof.
18. The bioconjugate of claim 1, wherein said organocobalt complex comprises a multiple unsaturated heterocyclic ring system bonded to a cobalt atom through 4-5 nitrogens and/or chalcogens which are part of said ring system.